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MEMO FOR RECORD

Serial: CPS-~~312~~<sup>313</sup>  
February 9, 1961

25X1A

From:

*CPS*

Subject: Summary of System Characteristics

On the following pages a summary of the camera system is given in the form of salient numbers and brief descriptions. The list is by no means complete, and revision will be made periodically. Design changes affecting the summary should be reported to the author who will keep a running file.

CPS/jje



25X1A

# Summary of System Characteristics

<u>Item</u>	<u>Characteristic</u>	<u>Status</u>	<u>Reference</u>
1 Camera system	Twin camera, convergent stereo, panoramic	Firm	
2 Type of IMC	Twisting image, slightly varying sweep velocity, constant film velocity	Firm	
3 Direction of sweep	Transverse to flight line, +y to -y	Firm	
4 Coverage, across flight line (from operational altitude)	$\pm 30^\circ$ of convergent stereo covering $\pm 8.5$ n. miles, 30 to $63^\circ$ both sides of conventional stereo covering up to 30 n. miles either side of flight line	Firm	
5 Coverage, parallel to flight line (per camera frame)	5.2 n. miles at flight line 11.6 n. miles at $63^\circ$	Firm	
6 Spacing between successive sweeps	0.1 x altitude over $\pm 30^\circ$ ; 0.2 x alt. from $30^\circ$ to $63^\circ$	Firm	CPS-303
7 Mounting angle between cameras	$14.4^\circ$	Firm	CPS-303
8 Forward overlap	72% at $0^\circ$ ) convergent stereo 76% at $30^\circ$ )  52% at $30^\circ$ ) conventional stereo 75% at $63^\circ$ )	Firm	CPS-303
9 Ground resolution(feet)	X 1.3 to 1.6 1.5 to 1.8  1.5 to 2.2 2.6 to 3.3	Y 1.3 to 1.5 1.7 to 2.1  1.7 to 2.8 6.3 to 7.7	Sweep Angle Estimated 0° )Convergent 30° )Stereo  30° )Conventional 63° )Stereo
10 Stereo base/height	.353 ( $30^\circ$ to $-30^\circ$ ) .200 ( $30^\circ$ to $63^\circ$ both sides)	Firm	CPS-303
11 Stereo acuity	1.5 feet near nadir	Estimated	
12 Duration of photography	136 minutes <u>maximum</u> including 5 minutes pre-run 126 minutes run 5 minutes post-run	Firm	

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<u>Item</u>	<u>Characteristic</u>	<u>Status</u>	<u>Reference</u>
13 Range of coverage	3740 n. miles <u>maximum</u> at V/H = .035	Firm	
14 V/H	.035 nominal .029 to .046 max. range .032 to .042 probable range .053 in emergency	Approx. range uncertain	
15 Cycle period	5.714 sec at V/H = .035	Firm	CPS-303
16 Duty cycle	66.5% on, 33.5% off	Firm	CPS-304
17 No. of frames	1428 per camera	Approx.	
18 Frame length	34.23" = nominal 93° sweep (21" ef) 34.59" = exposed length .45" to .80" interframe spacing 35.04" to 35.39" total (35.22" average total)	Firm Approx. Approx. Approx.	CPS-307
19 Film length	4200 feet per camera <u>maximum</u>	Firm	
20 Image width	7.48"	Firm	CPS-303
21 Film width	7.960" ± .010"	Firm	
22 Film thickness	0.0029" ± .0002"	Firm	
23 Roll diameter (4-1/2" core)	14.9" dia. <u>max.</u>	Firm	
24 Film weight	63 lb/camera <u>max.</u> (126 lb. <u>max.</u> total)	Firm	
25 Lens	J241, modified triplet with 9 elements, thermally stabilized	Firm	
26 Focal length	21" ± 1%	Firm	CPS-301
27 Field	±10.1°, 7.48"	Firm	CPS-303
28 F/No.	4	Firm	
29 Filter	Orange, Wratten #21 equivalent	Approx.	
30 Window material	Fused silica	Firm	
size (clear aperture)	22" wide, 23-1/2" long, 1" thick	Firm	
coating (inside)	Low emissivity in IR (≈ 0.1)	Tentative	
transmission	79% average from 550 to 700 mμ	Approx.	

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<u>Item</u>	<u>Characteristic</u>	<u>Status</u>	<u>Reference</u>
31 Thermal window sandwich size material thickness coatings transmission	8" dia. LBC-2 and filter glass 3/8" each, 1.0" total sandwich Low emissivity on one inside surface 79%	Approx. Tentative Tentative Tentative Approx.	
32 Sweep mirror size material	13" long, 10" max. width Aluminum	Approx. Tentative	
33 Additional imaging optics	Focusing mirror 3 mirror image twister for IMC	Firm Firm	
34 Optical transmission	26.5% (visible light)	Estimated	
35 T-stop	6.9	Estimated	
36 Emulsion	S0-132	Firm	
37 Lens-film resolution	130 1/mm at 0° 100 1/mm at 5° 65 1/mm at 10°	Estimated	
38 Spectral sensitivity (with filter)	550 to 720 mμ, pk at 690	Firm	
39 Development	Special	Tentative	CPS-305
40 Speed point	1.1 log meter-candle-sec	Estimated	CPS-305
41 Exposure settings	1/25, 1/50, 1/100 nom., 1/200 sec.	Tentative	
42 Slit widths	.36", .18", .09" nom., .045" width ± 10%, ± .025" centering with respect to platen	Tentative Firm	
43 Slit length	7.48"	Firm	CPS-303
44 Capping shutter	At focal plane, closed between cycles and when camera is off	Firm	CPS-306
45 Film velocity During sweep Average	9.0088 in/sec {at V/H .035 6.132 ± 1% in/sec} and ef = 21"	Firm Firm	CPS-304 CPS-307

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# Summary of System Characteristics

<u>Item</u>	<u>Characteristic</u>	<u>Status</u>	<u>Reference</u>
46 Sweep rate	24.4 to 24.6 °/sec at V/H = .035	Firm	CPS-304
47 Image twist	2.1° to 4.6°	Firm	CPS-304
48 Platen			CPS-310
Speed	3 revolutions per cycle exactly	Firm	
Size	5.4456" ± .001" diameter for 21" of .0002" runout	Firm	
49 V/H signal	Voltage (analog)	Tentative	
50 Control	Autocycle, rate controlled by V/H. Two intervalometers, one per camera, one master and one sub.	Firm	
51 Phase tolerance of sweep	±1°	Firm	CPS-307
52 Phase tolerance between cameras	±1% of cycle	Firm	CPS-307
53 Data recording (edge of each frame)			REG-301
Fixed data	Mission No. Camera No. Date	Firm	
Time	1KC track with omission of 1, 2 and 3 Pulses respectively every .01, .1 and 1 second		
Nadir	Additional pulse between normal 1KC pulses		
Coded data			
Format	Two synchronizing tracks and four data tracks, in parallel along edge of film	Firm	
Code	Binary coded decimal	Tentative	
Data	Roll	Not in pro-	
	Pitch	otype	
		Not in pro-	
		otype	
	Ground track	Firm	
	True heading	Firm	
	Longitude	Firm	
	Latitude	Firm	
	Ground speed	Firm	
	Elapsed time	Firm	
	V/H	Tentative	

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<u>Item</u>	<u>Characteristic</u>	<u>Status</u>	<u>Reference</u>
Data record after flight	Security classification Code no. or name Frame no.		
54 Autofocus			
Focus tolerance	$\pm .0005"$	Estimated	DJSJ-301
Range			
Grid pitch			
55 Autobalance			
Range	$\pm 45$ in.lb		
Rate of correction	0.05 in.lb/cycle, max.		
Balance tolerance	$\pm 5$ in.lb or .011" cg shift		DM 31 Dec. '60
56 Vibration isolation	Viscous damped isolator		
Residual vibration	0.15g at 10 cps & 100 cps		DM 22 Nov. '60
Natural period	7.67 cps		
57 Stabilization	Rate stabilization during on cycle Reset to vehicle attitude during off cycle		DM 31 Dec. '60
Settling period	0.4 sec		
Natural period	$P_x = 22.4$ sec $P_y = 21.7$ sec $P_z = 18.6$ sec		
58 Cage Limits	$\pm 4^\circ$ rate stabilized $\pm 4-1/2^\circ$ electrically caged $\pm 5^\circ$ mechanical stops	Firm	DM 31 Dec. '60
59 IMC tolerance	2.52% total for 1/100 sec. exposure	Approx.	CPS-312
60 Tolerance breakdown		Approx.	CPS-312
Terrain variations within frame	$\pm 500'$		
V/H measurement	$\pm 1\%$		
IMC or camera rate	$\pm 0.5\%$		
Sweep rate with respect to film rate	$\pm 0.1\%$		
Sweep mirror vibration (>100 cps)	$\pm 0.2\%$		
Twist angle of 3 mirrors for prism	$\pm 2$ arc minutes		

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<u>Item</u>	<u>Characteristic</u>	<u>Status</u>	<u>Reference</u>
Attitude			
Roll	$\pm 0.9^\circ$		
Pitch	$\pm 1.8^\circ$		
Yaw	$\pm 0.8^\circ$		
Attitude rate	$\pm 0.5$ mr/sec about each axis		
Angular vibration ( $> 100$ cps)	$\pm 0.4\mu$ image motion		
61 Attitude tolerance breakdown	Roll Pitch Yaw		
Camera boresight to vehicle	$\pm 0.2^\circ$ $\pm 0.2^\circ$ $\pm 0.2^\circ$		
Platform zero set	$\pm 0.1^\circ$ $\pm 0.1$ $\pm 0.1$		
Vehicle roll	$\pm 0.11^\circ$ $\pm 0.11$ $\pm 0.11$		
Platform roll	$\pm 0.286^\circ$ $\pm 0.286$ $\pm 0.071$		
Maneuvering	$\pm 0.8^\circ$		
Angle of attack	$\pm 1.8$		
Cross winds		$\pm 0.78$	
Total (RSS)	$\pm 0.9$ $\pm 1.8$ $\pm 0.8$		
62 Weight		Estimated	
Window & frame	70 lb		DFR-301
Isolator & Stabilizer	80 lb		DM 31 May '60
V/H device	33 lb		
Camera stabilized portion			DFR-301
Separately mounted electronics	71 lb		DFR-301
Misc.	15		DFR-301
Total w/o window			
63 Moment of inertia			
$I_x$	$225 \text{ lb in sec}^2$	Approx.	WM 31 Dec. '60
$I_y$	253		
$I_z$	176		
64 Power		Estimated	RLW-311
On stabilized camera	Avg. 105 watts Peak 238 watts		
Off stabilized camera	316		
Isolator & stabilizer	118		
Total	539		
Heaters(not during camera operation)		4000	

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65 Atmosphere			
Gas	Helium	Firm	
Pressure	1.5 psia	Approx.	
Temperature			
Oven	476-380°F	Approx.	
Bay	78-115°F	Approx.	
Top batch	78-100°F	Approx.	
66 Test Equipment			
Alignment jigs			
Test collimator			
Test console			
Misc.			